

ROBOT HAVING MULTIPLE DEGREES OF FREEDOM

Abstract of the Invention

5 An improvement is set forth in a robotic arm
structure which includes at least two links. θ motion
is provided about a primary axis at the proximal end
portion of the proximalmost of the links. R motion
10 proceeds radially from the primary axis whereby the
distal end portion of the distalmost of the links can
be moved in a radially extending straight line. An end
effector is pivotally mounted for rotation relative to
the distal end portion of the distalmost link about an
15 end effector axis which is parallel to the primary
axis. The structure is improved by adding one or more
of a yaw motor, a roll motor and a pitch motor for
rotating the wrist of the arm about the respective
axes. A sensor array senses the R, θ , Z and yaw, roll
20 and/or pitch motions and creates and transmits
electronic signals representative thereof to a computer
controller which monitors and controls the R, θ , Z and
yaw, roll and/or pitch motions. Non-radial straight
line motion and indeed, in certain embodiments any
25 desired three-dimensional motion, is thereby enabled as
is picking up of workpieces such as semiconductor
wafers, flat panel displays and data storage disks,
which are misaligned in cassettes or at workstations
and/or are in cassettes which are misaligned and/or
30 aligned and set up at an angle relative to the usual
plane of operation of the arm.